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ABSTRACT

Described is an NSF sponsored five week summer institute for 35 teachers and administrators interested in implementing AAAS Science - A Process Approach. Prior to the institute, interaction data were gathered while observing 18 of the 30 teachers teaching a science lesson of their own choice. The composite matrix indicated that someone was talking approximately 80 percent of the time; approximately 52.7 percent of the time it was teacher talk. The format of the institute included the activities of the AAAS Guide for Inservice Instruction. In addition, a series of 11 experimental stations were set up the final week and the participants worked on these experiments which required a synthesis of process skills. Pre- and post-measure scores on the Science Process Measure for Teachers indicated that prior to instruction the participants had a mean score of 11.40 out of a possible 25. After instruction, the group mean was 20.86. The results of the pre-institute interaction observations were used along with audio-training tapes to acquaint the teachers with the Flanders System. Post-institute interaction data (collected on 9 teachers) indicated that the category of silence or confusion increased from 17.93 percent to 29.80 percent. Teacher talk was reduced very slightly and student talk was reduced from 29.37 to 19.54 percent. (BR)

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ASSESSMENT OF THE AAAS SCIENCE - A PROCESS APPROACH INSTITUTE-A COOPERATIVE COLLEGE-SCHOOL SCIENCE PROJECT

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One of the major challenges facing researchers in science education is to establish the credibility of our research with science teachers who might be expected to reap benefits from our efforts. It is sometimes difficult for teachers to understand or appreciate the potential of educational research for improving teacher effectiveness in the classroom. The NSF Cooperative College-School Science Program provides an excellent opportunity to involve teachers in research techniques and interpretation of data relevant to teaching.

The purpose of this paper then is to describe a NSF sponsored five week summer institute for 35 teachers and administrators interested in implementing AAAS Science-A Process Approach. Particular attention will be focused on the involvement of teachers in the evaluative aspects of the summer program and the subsequent academic year implementation.

Thirty elementary school teachers and five administrators were selected as institute participants from 13 rural school districts comprising the Flint Hills Educational Research and Development Association in south central Kansas. In April and May of 1969, the Flanders System of interaction analysis was

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used in 18 of the 30 classrooms to provide a composite matrix of classroom verbal interaction existing prior to the summer institute program. It was anticipated that classroom observations conducted the following year would indicate areas of change perhaps attributable to a combination of summer institute work and use of the new science materials. A comparison of this phase of the study will be discussed later in the paper.

The 1969 five week summer institute was held in the Science Building on the campus of Kansas State Teachers College and in the nearby Butcher Elementary campus school. Dr. Ed Kurtz was the co-director of the project and Mr. Herb Simmons was the coordinator of the micro-teaching phase of the program.

The format of the institute included the activities suggested in the AAAS Guide for In-service Training. In addition, a series of 11 experimental stations were set up the fifth week to encourage the participants to work on AAAS exercises which required a synthesis of the individual process skills which had been previously developed.

The participants also observed and worked with four afternoon classes of first and second grade students in Butcher Elementary School. Mr. Herb Simmons taught AAAS science exercises the first week and the participants observed through sound booths equipped with one way glass. During the next three weeks teams of two teachers worked with groups of three and four students. In the final week each participant worked with one child. Selected

activities from 24 AAAS exercises in Parts A, B, and C were taught in the four classes during the five week period.

The participants received personal copies of the AAAS Commentary for Teachers; response sheets for AAAS Guide for In-service Instruction; and either Part B or Part C teacher texts for the AAAS Science-A Process Approach. Individual copies of a book by Amidon and Flanders, The Role of the Teacher in the Classroom A Manual for Understanding and Improving Teacher Classroom Behavior were also provided.

Science Process Measure for Teachers

The effectiveness of the summer institute was reflected in part by the pre-to post-measure gain in competency based on the Science Process Measure for Teachers, forms A and B. The pre-measure was administered on the second day of the institute and served as a means both of obtaining data and of informing the teachers as to the nature of the process skills which would be investigated in the program. The post-measure was administered at the end of the institute.

The analysis of the scores on the pre-and post-measures of the teachers provided the following statistics:

	Pre-Measure	Post-Measure	t-Test
Score Possible	25	25	
Subjects	35	35	
Mean	11.40	20.86	11.3[a]
Standard Deviation	4.67	2.15	
Range	3-20	15-24	

[a]Significant beyond the .001 level

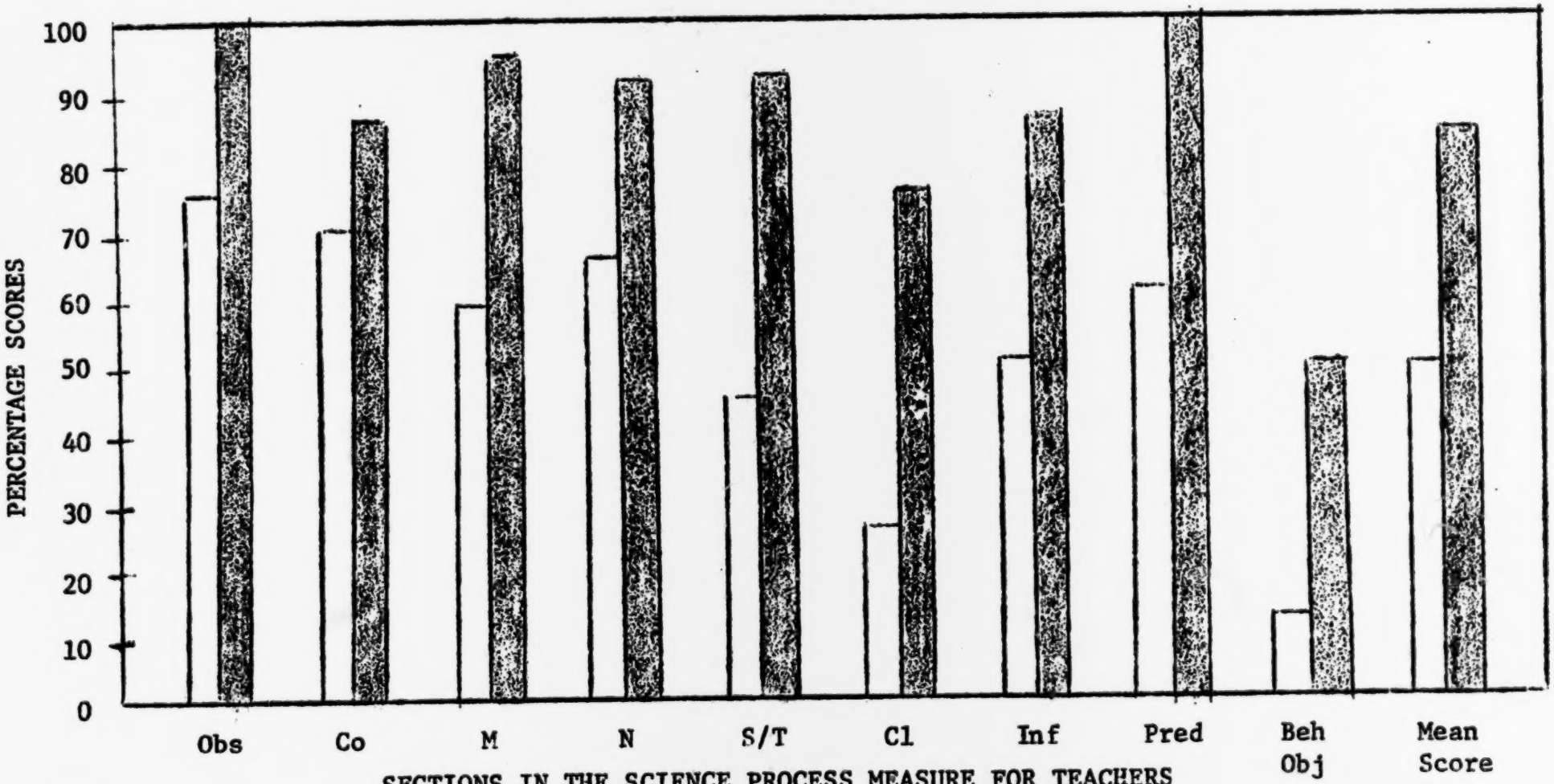
The accompanying graph indicates the relative gain in competence in nine areas stressed in the Science Process Measure for Teachers. The post-measure results indicated that on five of the nine sections of the test the mean score was above the 90th percentile. Only two mean sub-scores, Classifying and Use of Behavioral Objectives, were below the 80th percentile.

Set of Competency Tasks

In anticipation of the need to provide the participants with pertinent and understandable data as to the process skills possessed by first and second grade students, two testing instruments were developed by the project staff. The Set of Competency Tasks, Parts A and B consisted of 112 tasks selected from existing competency measures associated with 34 exercises in Parts A and B of Science-A Process Approach. A second test, The Set of Competency Tasks, Parts B and C, consisted of 105 competency tasks selected from 24 exercises in Parts B and C of Science-A Process Approach.

The participants viewed a video-taped testing sequence and discussed the procedures and ground rules for administering the tests. In teams of two, the participants next went through one of the tests and familiarized themselves with the questions and supplies. Since each instrument required approximately one and a half hours to administer, each instrument was divided into

COMPARISON OF MEAN SCORES ON THE PRE- AND POST-MEASURES OF 35 TEACHERS



SECTIONS IN THE SCIENCE PROCESS MEASURE FOR TEACHERS

Pre-test scores

Post-test scores

Obs - Observing
Co - Communicating
M - Measuring (metric)
N - Using Numbers
S/T - Space/Time Relationships
Cl - Classifying
Inf - Inferring
Pred - Predicting
Beh Obj - Behavioral Objectives

two parts. Each team of testers spent a full day administering one of the parts of the instruments to four to six students in their respective school districts.

The combined test results were analyzed by the participants in terms of where one might begin teaching a particular process, such as measuring. In addition, each team of teachers, obtained information concerning a small sample of students that they would be instructing in the 1969-70 school year. The results of this study are presented in Tables I and II. The mean responses to individual tasks are combined under eight process headings.

The project staff conducted a testing program using the same instruments as a part of a pre- and post-test design. This data is also included in Tables I and II.

The data on the Set of Competency Tasks, Parts A and B indicated that when the tests were administered by teachers that the mean student scores were higher on five of the six sub-tests in comparison with the student tested by the staff.

If one could assume that the two student population samples were similar in ability it would appear that the teachers might have tended to read too much into the students' responses. This possibility was discussed with the institute participants since they were expected to gather competency measure data on individual exercises during the academic year. The data from the Set of Competency Tasks, Part B and C neither supported nor refuted the possibility of observer bias in the administering of the test. No detailed statistical analysis was attempted since the contrasting data were collected for two differect purposes under different conditions.

TABLE I
MEAN SUB-SCORES ON SET OF COMPETENCY TASKS PARTS A AND B
FOR TWO GROUPS OF FIRST GRADERS

	MEAN ACCEPTABLE RESPONSES		TOTAL POSSIBLE SCORE
	Tested by Participant (N=47+28)	Tested by Staff (N=30+25)	
Observing	9.7	5.7	16
Measuring	10.8	6.7	21
Classifying	5.3	3.9	8
Using Numbers	8.5	8.9	19
Communicating	6.4	3.5	21
Space/Time	11.3	11.1	27

TABLE II
MEAN SUB-SCORES ON SET OF COMPETENCY TASKS, PART B AND C
FOR TWO GROUPS OF SECOND GRADERS

	MEAN ACCEPTABLE RESPONSES		TOTAL POSSIBLE SCORE
	Tested by Participant (N=30+21)	Tested by Staff (N=26+27)	
Observing	5.4	6.3	8
Classifying	4.2	4.8	10
Measuring	7.3	7.5	18
Communicating	5.4	4.0	19
Using Numbers	9.4	9.6	18
Space/Time	3.7	2.1	7
Predicting	3.8	2.9	12
Inferring	7.6	4.9	13

Interaction Analysis

The Flanders System of interaction analysis was used to gather data on the teacher-pupil verbal interaction in 18 classrooms prior to the summer institute. Each of the 18 teachers was observed while teaching an independently planned science lesson. The resulting composite matrix, composed of 3,457 tallies, indicated that on the average 52.7 per cent of the total class time involved teacher talk, student talk accounted for 29.4 per cent of the total time and silent activities or confusion accounted for 17.9 per cent of the time.

The results of the pre-institute interaction observations were used along with audio training tapes to acquaint the teachers with the Flanders System of interaction analysis. The purpose of this ten hours of training was to provide the participants with one system for quantifying verbal interaction during the observation phase of the institute and at the same time to suggest a way for each individual to look at his own teaching style when he returned to the classroom.

The in-service phase of this project is currently underway and it is not possible at this time to fully assess the changes in classroom interaction. However video-tapes of nine participants using the AAAS materials have been tabulated using interaction analysis and the results are given in Table III along with data from the pre-institute observations.

In comparing the post-institute interaction data with the pre-institute observational data, it appears that the category of silence or confusion has increased from 17.93 per cent to 29.80 per cent reflecting more student involvement. Teacher talk has been reduced only slightly and student talk has been reduced from 29.37 per cent to 19.54 per cent. The various I/D Ratios have only changed slightly.

TABLE III

PRE AND POST-MEASURES OF INTERACTION ANALYSIS FACTORS

	Pre-Measure Spring of 1969 (N=18 teachers)	Post-Measure* Fall of 1969 (N=9 teachers)
I/D Ratio	0.510	0.599
Revised I/D Ratio	0.501	0.465
Extended Indirect	1.28	1.25
Extended Direct	3.67	4.64
Per Cent Teacher Talk	52.70	50.66
Per Cent Student Talk	29.37	19.54
Per Cent Column 1	0.20	0.55
Per Cent Column 2	5.73	6.24
Per Cent Column 3	4.89	5.61
Per Cent Column 4	16.05	17.95
Per Cent Column 5	15.07	6.03
Per Cent Column 6	8.94	12.82
Per Cent Column 7	1.82	1.46
Per Cent Column 8	17.62	13.58
Per Cent Column 9	11.74	5.96
Per Cent Column 10	17.93	29.80

* Data to eventually include 18 teachers

Assessment of the Academic Year In-Service

Six of a series of twelve half day in-service workshops have already been conducted. At the conclusion of each of these sessions brief assessment forms were filled out anonymously by the participants. The form consisted of two or three statements outlining the principal activities of the session with a one to ten scale to be marked. This informal feed back from an average of 20 teachers was useful in planning subsequent sessions. Some of the activities that were well received included: discussion in small groups, observation and discussion of video-tapes of participants teaching, presentation on central supply systems, and discussion by Dr. Kurtz regarding AAAS programs underway in other parts of the country.

The concluding phase of the assessment of the academic year phase will be based on post-measure data gained from the two Set of Competency Tasks administered to the experimental and control groups of first and second grade students.

The Teacher Feedback forms will also provide information regarding preparation time, instructional time, student interest, and teacher assessment of each exercise taught. The participants have also agreed to administer competency measures to three students after each of five exercises.

Limitations and Recommendations

A substantial portion of the summer institute was directed toward teacher involvement with students in the campus school. It would seem that instead of inititally projecting the participants into teaching situations with observers present, it would have been better to let the teachers initiallly administer competency measures after several complete exercises had been taught by a staff member. This would be followed by one to one teaching and eventually one teacher working with a small group.

The potential of the interaction analysis training would have been enhanced if all teachers could have been video taped while teaching, then each teacher could have constructed his own matrix for interpretaion. Ideally the teacher should be video taped several times to provide him with an opportunity to attempt to alter his teaching and receive feedback.

The opportunity to work at eleven experimental stations was seemingly a successful culminating activity during the last week of the institute. It would be interesting to lengthen the period in which the teachers could investigate a particular problem and determine whether the teachers demonstrated interest in repeating an experiment or in altering their problem solving approach.

In summary the participants in the summer program actively engaged in improving their own intellectual skills in preparation for working with students. The concept of behavioral objectives

as a basis for instruction and assessment of the progress of students was hopefully reinforced by the micro-teaching activities and the gathering of competency task data from students.

The half day in-service meetings held to date have provided the teachers an opportunity to compare notes, discuss problems, and receive encouragement from one another. The staff has attempted to provide experiences which would provoke discussion and encourage change on the part of the teachers.